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Visual Thinking and Reading Comprehension: Foreign Language Setting as an Example

Zainab Al-Shdeifat*
Yarmouk University, JORDAN

Dina Al-Jamal
Yarmouk University, JORDAN

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Abstract: This study examines how visual thinking may affect Jordanian female ninth-graders reading abilities. The design had an experimental feel about it. The study included 66 ninth-grade female students who were studying English as a foreign language (EFL). An instructional program was created and put into place, and a pre-post reading exam was created to help the study reach its objective. The results were examined using SPSS. The findings show that there are statistically significant changes in the steps of the visual thinking strategy (VTS) modality between the two groups, with the experimental group benefiting more. VTS has been proven to be a successful strategy for greatly enhancing student attainment of good marks and having an impact on student achievement of course learning outcomes. This study triggered the following reading sub-skills: vocabulary acquisition, imaging, building and activating schema, identifying the main idea and details, questioning, inferring, communicating through oral language, and comprehension. VTS has a real impact on teaching reading sub-skills, which is important for both teachers and curriculum designers. Longitudinal research data is required to further analyze and refine this teaching strategy.

Keywords: *Imagery, reading sub-Skills, visual thinking strategy, visualization, Yarmouk University.*

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Introduction

It's been said that reading is a challenging linguistic, social, and cognitive process that involves the reader, the author, the text, the context, and the purpose (Hedgcock & Ferris, 2009). Good reading requires these sub-skills and methods, including vocabulary learning, picturing, creating and activating background knowledge, identifying the major concept and details, questioning, inferring, and communicating through spoken language (Zelvis, 2008). These sub-skills and methods are part of visual thinking strategy (VTS) and reading sub-skills therefore, they are the focus of this study which looked at the VTS as an additional strategy for teaching reading sub-skills. These sub-skills are introduced next.

Students acquire more vocabulary items and are more likely to recall new terms if they can visualize them. Reading is the primary method for learning new terms (Nagy et al., 1985). According to Arnheim (1969), every word carries a visual image. As readers build up their vocabulary, they will be able to apply it to longer texts and better understand. Students' vocabulary knowledge may expand as they debate both actual and abstract concepts from images in VTS. Writing (Franco & Unrath, 2014), critical thinking (Yenawine & Miller, 2014), and students reading, comprehension, creativity, and analytical skills have all been demonstrated to improve with VTS (Landorf, 2006).

The improvement of background knowledge, vocabulary, inference, and comprehension monitoring abilities requires constant focus across school levels (Elleman & Oslund, 2019). According to Bartlett (1932, p. 201), a schema is "an active structuring of prior emotions or experiences." Schema theory explains that when people read a text, they use many different kinds of knowledge they already have. Understanding entails the incorporation of new knowledge into the preexisting schema (Carrell, 1983; Hudson, 1982; Rumelhart, 1980). Comprehension is challenging if the schema is underdeveloped (Pearson et al., 1979).

The practice of inquiring, examining, and speculating while reading is a sub-skill of questioning (Mantione & Smead, 2003). More questions can be asked to help students develop such mental images to visualize the material. In VTS, students' thinking is clarified through questioning as groups explore how to derive meaning from a visual art print (Zelvis, 2008). As they ask more questions, students will learn more about the text, information that will help them draw on existing knowledge, extrapolate information from the text, or imagine what is happening in the text (Mills,

* **Corresponding author:**
Zainab Al-Shdeifat, Yarmouk University, Irbid, Jordan. ✉ zeainb.shdefat79@gmail.com

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2009). It promotes a student-centered environment through the use of intriguing and open-ended questions as well as the facilitator's paraphrasing of student responses to validate and support growth (Hess et al., 2019).

Regarding inferring, it is related to personal meaning-making that depends on the reader's incorporation of the author's information into their own framework of background knowledge, textual associations, questions, and hypotheses (Mantione & Smead, 2003). In standardized reading examinations, questions concerning the main topic, cause-and-effect relationships, and drawing conclusions are commonly used to assess this competency (Hamouda & Tarlochan, 2015). Jang (2009) discovered that questions assessing the inferencing sub-skill were more cognitively demanding and required test-takers to apply many abilities at the same time. These abilities include the ability to comprehend complicated language and structural aspects, as well as the ability to combine existing data to construct meaning (Graesser et al., 1994; McKoon & Ratcliff, 1992; Van den Broek et al., 1999).

To understand a book, a reader must be able to deduce meaning from the context. To interpret and comprehend the material, readers must update their predictions and draw on their own worldviews. A good reader must be able to "read between the lines" and see beyond what is immediately apparent while still focusing on the text (Mantione & Smead, 2003). The capacity of art to captivate and retain viewers as they strive to decipher meaning by relating the piece to their own worldview (Zelvis, 2008). Teachers can help their pupils improve their reading comprehension by focusing on predicting, making associations, imagining, inferring, questioning, summarizing, and so on (Block & Israel, 2005).

According to Norris and Hoffman (2002), reading as a mental process entails the interaction of some linguistic processes and preexisting knowledge bases classified as print decoding and comprehension processes. Both reading and thinking in a foreign language go hand-in-hand (Kaya, 2015). In order to demonstrate the importance, contextual decoding, and linguistic understanding of a given text, the straightforward perspective on reading as articulated by Duke and Cartwright (2021) is a useful tool. EFL readers must exert more effort to comprehend what they read since they must read the same texts more frequently than native speakers or devote more time to them (Andoko et al., 2020).

Students visualize by imagining themselves in the shoes of the reader and imagining the author's intended meaning (Mills, 2009). Students visualize by using their imagination to create mental images. Students are imagining how a movie or photo book based on the text they are reading might look. As a result, new concepts will be linked to previously held knowledge. According to Mills, students will struggle to understand new information if they are unable to mentally picture what they hear, read, smell, or touch.

According to Cappello and Walker's 2016 definition, VTS is a student-centered, interactive, interpretive method that requires active participation. Learners create knowledge by expanding and enhancing their personal and societal environments. Visual thinking is now a key aspect of the perceptual process, with visualization serving as a necessary partner to verbal and symbolic modes of expression (McLoughlin & Krakowski, 2001). Visualization is the process of forming an image from what has been read. The reader retains this picture as an illustration of how well they comprehended the material (National Reading Panel, 2000).

The visualization strategy has benefits and drawbacks. The advantages of using a visualization method include making students feel more involved in the teaching and learning process, making them simpler to understand, and enhancing their imagination and critical thinking, which in turn boosts their motivation to study (Aulia, 2017). The disadvantage of utilizing this strategy is that the instructor cannot deliver the long passage since the students lack vocabulary knowledge, thus the teacher can only give the student convenient text to grasp (Aulia, 2017).

Nelson (2005) outlines what these VTS are and how they are carried out. These strategies are: visualizing with wordless pictures, visualizing from a vivid piece of text, and visualizing while reading and sharing instead of telling. The students in visualizing with wordless pictures use a few hints to guess what comes next. The students sketch out and visualize their predictions. The students finally offer their forecast. Visualizing from a vivid piece of text is the second strategy. In this strategy, the teacher reads the text aloud and pauses at a predetermined point to allow the students to visualize the situation. Before beginning to draw, the pupils discuss their visualization in groups.

Visualizing while reading and sharing instead of telling is the third strategy. With the use of this strategy, students read a passage that was rich in vivid nouns and verbs. While the students picture the situation, the teacher reads aloud from the chapter. Comments from the kids are requested. The teacher labels the section of the speech after the remarks are made. This strategy aids the student's comprehension of the reading and their learning of parts of speech (Erlita, 2021).

VTS can explain know-how and broaden comprehension in three basic means (McLoughlin & Krakowski, 2001). First, visual thinking occurs when persons verbally represent and express knowledge that has been extracted from a map, chart, or table. Second, using a diagram to describe, record, calculate, or illustrate the steps needed to arrive at a solution is an example of how visual thinking may be essential to problem-solving. Third, visual illustration can aid in communication. For example, information can be conveyed, data can be represented, and relationships can be shown utilizing diagrammatic and visual representations. According to prior studies, VTS training enhances critical thinking abilities to go to the person's area of expertise or other academic disciplines (Housen, 1999).

Statement of the Problem

Students typically face some difficulty understanding written texts, according to the researcher's teaching and administration experience. These difficulties are reflected in their weakness to answer comprehension questions, inferring ideas, identifying main ideas, demonstrating the meaning of vocabulary items, extracting information, and relating new information to their prior knowledge.

Despite receiving minimal comprehension instruction from EFL teachers, students in the tenth grade in Jordan were assessed as having modest reading comprehension proficiency by Al-Jamal et al. (2013). Similarly, Qarqez and Ab Rashid (2017) reported that EFL secondary school students in Jordan struggle with reading comprehension due to ambiguous terms, the use of a foreign language, and a lack of time to fully process the information. Also, according to Al-Husban (2019), Jordanian teachers are unprepared for the challenges of instructing the English language. Therefore, the current study using VTS can aid students in improving their reading sub-skills.

Purpose of the Study

This study looks at how the visual thinking strategy may affect the reading comprehension of female EFL students in Jordanian ninth grade.

Question of the Study

This study addresses this problem by determining whether there are statistically significant differences ($\alpha = .05$) in the reading sub-skills of Jordanian EFL students receiving VTS and conventional instruction.

The Study's Importance

The different VTS activities presented in this study may enable EFL teachers to help their students become more proficient readers. This work is significant in this regard. EFL teachers are given a range of ideas and exercises they can use hopefully to improve and deepen the reading of their students. It is probably to enhance reading for teaching reading skills, that curriculum designers may integrate the VTS processes into the EFL curriculum.

Operational Definition of Terms

Visual Thinking Strategies (VTS) are defined by Housen (1983) as a sequential curriculum that involves teacher-led discussions about art in the classroom, annual trips to art museums, and teacher development, viewing and debating artistic creations through the use of a debate facilitator. Yenawine (2013) based the VTS process on a triangular unit: look (quietly focus on the image), think, and discuss (respond to questions, discuss one's view). Khoury (2016) included art-related imagery, silent observation, three questions, paraphrasing, and objectivity in the VTS. Similarly, Ali (2018) described VTS as the ability to visualize as the capacity to form mental images, draw them out on paper, or use technological aids to convey information, generate and explore new ideas, and gain deeper insights into existing ones. Tomlinson (1997, p.1) defines visualization as "the process of perceiving images in minds". Also, VTS can be defined as a teaching strategy that uses instructor-led discussions of visual pictures to improve critical thinking skills. The VTS curriculum and teaching strategy employ art to assist students in thinking critically, listening attentively, communicating, and collaborating. With the visualizing reading strategy, readers construct mental pictures of the texts. The created images are mostly influenced by their background knowledge (Wicaksono, 2016).

In light of the aforementioned conceptions, the VTS in this study refers to these images, whether drawn mentally or presented in the classroom, stimulating open discussion among students as well as the development and questioning of the teacher. Through observing and discussing visual art images in Action Pack 9, the Visual Thinking Strategy (VTS) seeks to enhance the reader's capacity to describe, examine, and evaluate visual imagery and information. Three questions will be utilized most frequently in this study. The first is, in this image, what is happening? What have you seen, specifically, that makes you say that, is the second question. The third is, what else can you find? These inquiries are meant to spark conversation (Hess et al., 2019).

Methodology

Sample and Data Collection

The study's 66 ninth-grade female learning EFL participants were specifically chosen by the researcher. They attended Al-Rubia Primary School for Girls, a government-run institution in Jordan's Mafraq Directorate of Education. During the first semester of the school year 2022-2023, the current study was carried out. Three ninth-grade female sections are present at this school. Two of the three portions were randomly chosen. Then, 33 students from one of the two parts were chosen at random to form the experimental group, while 33 students from the other section were chosen to form the control group. To ensure that the pupils in the two groups were equivalent, pre-tests were administered and both groups were taught by the same teacher.

The current study employed a quasi-experimental design. In this design, there is one experimental group and one control group. The control group received standard ninth-grade instruction as outlined in the recommended textbook. Whereas the experimental group instructed using the Ministry-mandated Teacher Book and Action Pack 9, which calls for the use of visual thinking tools like pictures, maps, videos, and acting out for every reading lesson. The Jordanian Action Pack served as a reference for the evaluation of the two groups at the start and completion of the program (eight weeks apart). The participants are intermediate level

The instructional mode with two levels serves as the study's independent variable (i.e., VTS vs. conventional). Additionally, the dependent variable is pupils' reading, which has eight levels of sub-skills (i.e., vocabulary acquisition, imaging, building and activating schema, identifying the main idea and detail, questioning, inferring, communicating through oral language, and understanding). The reading sub-skills of the students serve as the dependent variable.

The pre-test of reading sub-skills was administered to both the experimental and control groups before the treatment to see if the two groups were comparable. To determine whether the two groups' reading comprehension levels were comparable, an independent samples t-test was utilized. Table 1 displays the results:

Table 1. T-test of the Equivalence of the Two Groups in the Overall and the Eight Sub-Skills Pre-test Scores of the Reading

Level	Group	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Vocabulary Acquisition	Control	2.4	1.5	- 0.85	64	.400
	Experimental	2.7	1.4			
Imaging	Control	3.8	2.5	- 0.66	64	.515
	Experimental	4.2	2.4			
Building And Activating Schema	Control	0.6	.66	- 0.73	64	.468
	Experimental	0.5	.51			
Identifying The Main Ideas and Details	Control	1.6	1.1	- 1.08	64	.286
	Experimental	1.9	1.1			
Questioning	Control	1.7	1.6	- 0.70	64	.484
	Experimental	2.0	1.7			
Inferring	Control	1.1	1.1	- 0.44	64	.663
	Experimental	1.2	1.2			
Communicating Through Oral Language	Control	1.6	1.9	- 1.89	64	.063
	Experimental	2.6	2.1			
Understanding	Control	1.2	0.6	- 1.13	64	.265
	Experimental	1.4	0.8			
Overall	Control	14.1	6.7	- 1.71	64	.093
	Experimental	16.6	4.8			

* Scored out of 45.

Table 1 demonstrates that there was no statistically significant difference between the two groups' performance on the eight sub-skills and overall pre-test scores. Therefore, it may be said that before the implementation of the VTS, the two groups were statistically equivalent.

The reading sub-skills test was developed after analyzing the reading sub-skills in the content of Modules 2 and 3 of Action Pack 9, and the same abilities and strategies are part of VTS. The test, consisting of 20 questions, assessed the reading sub-skills of acquiring vocabulary, imaging, building and activating schema, identifying the main ideas and details, questioning, inferencing, communicating through oral language, and understanding.

The experimental group was instructed through VTS, whereas the control group received traditional instruction in accordance with the guidelines provided in the Teacher's Book. Some of these lesson plans are included in Appendix A.

The table of specifications was used to assess the test's content validity. Additionally, a jury of six university professors, two supervisors of the English language, and one supervisor of Arabic reviewed the validity. The jury gave positive feedback and approved the instruments. The appropriateness of the language, content, and sufficiency was requested of the jury. The final test took into account all of the jury's feedback and suggestions, such as correcting unclear questions.

To determine the validity of the test, a pilot study of 36 students was used (internal consistency) (see the test in Appendix B). The item score and test score were then correlated using the Pearson correlation coefficient. The test's item scores and overall score were shown to have Pearson correlation coefficients between and (.55-.93). Additionally, the test's Cronbach's alpha and test-retest coefficients were retrieved; the results showed that the test's Cronbach's alpha coefficients are.87 and .91, respectively. The exam is reliable and appropriate for evaluating students' reading comprehension because the reliability coefficients are over the cutoff value (0.70).

Analyzing of Data

The following statistical investigations were carried out in order to respond to the research question:

1. One-way Analysis of Covariance (One-way ANCOVA) was performed to analyze the relationship between the teaching method and the overall reading sub-skills of the students.

2. One-Way Multivariate Analyses of Covariance (One-Way MANCOVA) and univariate analysis were used to examine the impact of instructional modality on reading sub-skills and VTS stages. Prior to conducting MANCOVA, the researcher confirmed no violation of the following assumptions: multivariate normality (i.e., the dependent variables distributed normally within each group of the independent variable (control and experimental), and the homogeneity of variances.

Results

The results showed that the mean scores of the experimental groups are higher than the mean scores of the control group in the overall reading sub-skills as measured by the reading sub-skills test. This question was addressed by calculating the means and standard deviations of the pre-and post-test scores in the overall reading sub-skills test for the two groups.

After removing the influence of the overall reading sub-skills pre-test scores, a one-way analysis of covariance (ANCOVA) was used to determine the statistically significant impact of the teaching modality (VTS vs. traditional) on the overall reading sub-skills, as displayed in Table 2.

Table 2. Results of One-way ANCOVA to Assess the Effect of Teaching Modality on the Overall Reading Comprehension after Controlling the Effect Pre-test Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pre-test (Covariate)	101.23	1	101.23	3.89	.053	.06
Teaching modality	3573.82	1	3573.82	137.35	.000	.69
Error	1639.24	63	26.02			
Corrected Total	5743.44	65				

Table 2 demonstrates statistically significant changes in favor of the experimental group in the overall reading sub-skills between the experimental and control groups. The teaching method explained 68.5% of the variance in reading comprehension overall, according to the partial eta squared value of 0.686.

Also retrieved were the adjusted and unadjusted means of the two groups' general reading comprehension. The averages, standard deviations, and standard errors for the two groups' total reading comprehension before and after adjusting for their pre-test scores are displayed in Table 3.

Table 3. Adjusted and Unadjusted Means of the Overall Reading Sub-Skills

	Unadjusted Mean		Adjusted Mean	
Group	Mean	S. D.	Mean	Std. Error
Control	21.2	5.6	21.5	.90
Experimental	36.8	4.8	36.5	.90

Table 3 shows observed differences between the two groups in the overall reading sub-skills after the differences in the overall reading comprehension pre-test scores were controlled. As such, the VTS modality enhanced the overall reading sub-skills of the experimental group.

The results showed that the post-performance scores of the experimental groups are higher than the control group's mean scores in the reading sub-skills as measured by the reading test. Additionally, the means and standard deviations of pre-and post-test scores in reading sub-skills for the two groups were calculated.

Following the effects of pre-test scores being taken into account, a one-way multivariate analysis of covariance (one-way MANCOVA) using a multivariate test (Hotellings' Trace) was used to assess the impact of the teaching modality (i.e., VTS vs. conventional approach) on the linear combination of the reading comprehension sub-skills. The main influence of the instructional modality was considerable, according to the results. This shows that there are differences between the two groups' linear reading sub-skill composites. The partial eta square score of .79 shows that the instructional modality accounts for 79.0% of the variance in the composite of the reading sub-skills. A follow-up univariate analysis (Tests of between-subject effects) was carried out since the effect of the instructional modality on the linear combination of the reading comprehension sub-skills is significant, according to Table 4.

Table 4. The Effect of the Instructional Modality on the Reading Sub-Skills after Controlling the Effect of Pre-test Scores

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Covariate1	Vocabulary acquisition	6.72	1	6.72	2.68	.107	.05
Covariate2	Imaging	0.65	1	0.65	0.32	.572	.01
Covariate3	Building and activating schema	.061	1	0.06	0.15	.704	.00
Covariate4	Identifying the main ideas and Details	0.05	1	0.05	0.10	.759	.00
Covariate5	Questioning	13.09	1	13.09	1.58	.214	.03
Covariate6	Inferring	0.01	1	0.01	0.01	.933	.00
Covariate7	Communicating through oral Language	7.45	1	7.45	3.88	.054	.07
Covariate8	Understanding	0.14	1	0.14	0.08	.784	.00
Teaching Modality	Vocabulary acquisition	68.61	1	68.61	27.37	.000	.33
	Imaging	138.85	1	138.851	68.85	.000	.55
	Building and activating schema	7.11	1	7.12	17.05	.000	.23
	Identifying the main idea and Detail	7.00	1	7.00	14.24	.000	.20
	Questioning	101.67	1	101.672	12.28	.001	.18
	Inferring	23.37	1	23.37	21.061	.000	.27
	Communicating through oral Language	46.00	1	46.00	23.98	.000	.30
	Understanding	99.91	1	99.91	55.72	.000	.50
Error	Vocabulary acquisition	140.39	56	2.51			
	Imaging	112.93	56	2.02			
	Building and activating schema	23.35	56	0.42			
	Identifying the main ideas and details	27.53	56	0.49			
	Questioning	463.67	56	8.28			
	Inferring	62.13	56	1.11			
	Communicating through oral Language	107.42	56	1.92			
	Understanding	100.411	56	1.793			
Corrected Total	Vocabulary acquisition	301.939	65				
	Imaging	318.621	65				
	Building and activating schema	38.773	65				
	Identifying the main ideas and details	40.985	65				
	Questioning	675.091	65				
	Inferring	106.258	65				
	Communicating through oral Language	201.167	65				
	Understanding	231.939	65				

Table 4 demonstrates that there were statistically significant variations in reading comprehension sub-skills between the two groups, favoring the experimental group. The partial eta squared values of .328, .551, .233,.203, .180, .273, .300, and.499 showed that the instructional modality explained 32.8%, 55.1%, 23.3%, 20.3%, 18.3%, 27.3%, 30%, and 49.9% of the variance in the following, respectively: vocabulary acquisition, imaging, building and activating schema, identifying the main ideas and details, questioning, inferring

The means of the reading sub-skills for the two groups were also extracted, both adjusted and unadjusted. The averages, standard deviations, and standard errors of the two groups' reading sub-skills before and after correcting for the results of the reading comprehension pre-test are displayed in Table 5.

Table 5. Adjusted and Unadjusted Means of the Reading Sub-skills

Dependent Variable	Group	Unadjusted mean		Adjusted mean	
		Mean	S. D	Mean	S. E
Vocabulary acquisition	Control	3.9	1.6	3.9	.28
	Experimental	6.1	2.1	6.0	.28
Imaging	Control	4.6	1.8	4.7	.25
	Experimental	7.9	1.0	7.8	.25
Building and activating schema	Control	1.0	0.9	1.0	.12
	Experimental	1.8	0.2	1.7	.12
Identifying the main idea and details	Control	2.0	0.9	2.0	.13
	Experimental	2.7	0.5	2.7	.13
Questioning	Control	3.6	2.1	3.4	.51
	Experimental	6.0	3.6	6.0	.51

Table 5. Continued

Dependent Variable	Group	Unadjusted mean		Adjusted mean	
		Mean	S. D	Mean	S. E
Inferring	Control	2.8	1.4	2.8	.19
	Experimental	4.1	0.7	4.1	.19
Communicating through oral language	Control	1.9	1.3	2.0	.25
	Experimental	3.8	1.6	3.7	.247
Understanding	Control	1.7	1.6	1.7	.25
	Experimental	4.4	0.9	4.3	.24

Table 5 demonstrates that after controlling for differences in pre-test scores, there are differences between the two groups on the reading sub-skills (i.e., vocabulary acquisition, imaging, building and activating schema, identifying the main ideas and details, questioning, inferring, communicating through oral language, and understanding). As a result, the VTS modality improved the students' sub-skills in reading comprehension.

The pre-and post-test scores in the VTS modality phases for the two groups were then determined, together with their averages and standard deviations. The post-performance scores for the experimental group in the VTS modality stages were higher than the mean scores for the control group, according to the reading comprehension test findings.

After adjusting for the effects of pre-test results, a one-way multivariate analysis of covariance (one-way MANCOVA) using a multivariate test (Hotellings' Trace) was carried out to determine the impact of the instructional modality (i.e., VTS vs. conventional approach) on the linear combination of the VTS modality steps. The main influence of the instructional modality was considerable, according to the results. This implies that there are variations in the linear composites of the VTS modality stages between the two groups. The instructional modality may account for 80.1% of the variance in the composite of the VTS modality steps, according to the partial eta square value of.801. The combination of the VTS modality steps is significantly impacted by the instructional modality, therefore further univariate analysis (Tests of between-subject effects) was carried out, as shown in Table 6.

Table 6. The Effect of the Instructional Modality on the VTS Modality Steps After Controlling the Effect of Pre-test Scores

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Covariate1	Guessing meaning, confirming and clarifying word meaning	6.37	1	6.37	2.454	.123	.04
Covariate2	Imagine	0.07	1	0.07	.155	.695	.00
Covariate3	Describing	2.35	1	2.35	1.500	.226	.03
Covariate4	Using prior knowledge	0.02	1	0.02	.047	.829	.00
Covariate5	Finding specific information	0.24	1	0.24	.503	.481	.01
Covariate6	Answer	1.80	1	1.80	1.06	.309	.02
Covariate7	Responding	0.11	1	.109	0.02	.902	.00
Covariate8	Predicting	0.09	1	.086	0.08	.784	.00
Covariate9	Expressing an opinion	8.41	1	8.413	4.29	.043	.07
Covariate10	Understanding	0.19	1	.192	0.10	.748	.00
Instructional modality	Guessing meaning, confirming and clarifying word meaning	67.95	1	67.95	26.16	.000	.33
	Imagining	16.29	1	16.29	34.61	.000	.39
	Describing	58.38	1	58.38	37.29	.000	.41
	Using prior knowledge	6.55	1	6.55	15.78	.000	.23
	Finding specific information	7.790	1	7.79	16.58	.000	.24
	Answering	16.27	1	16.27	9.57	.003	.15
	Responding	37.41	1	37.41	5.19	.027	.09
	Predicting	23.44	1	23.44	20.75	.000	.28
	Expressing opinion	43.80	1	43.80	22.34	.000	.29
	Understanding	99.60	1	99.60	54.06	.000	.50
Error	Guessing meaning, confirming and clarifying word meaning	140.25	54	2.60			
	Imagine	25.42	54	0.47			
	Describing	84.55	54	1.57			
	Using prior knowledge	22.406	54	.415			
	Finding specific information	25.376	54	.470			

Table 6. Continued

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Error	Answer	91.820	54	1.700			
	Responding	389.262	54	7.209			
	Predicting	61.009	54	1.130			
	Expressing an opinion	105.896	54	1.961			
	Understanding	99.499	54	1.843			
Corrected Total	Guessing meaning, confirming and clarifying word meaning	301.939	65				
	Imagining	52.121	65				
	Describing	178.500	65				
	Using prior knowledge	38.773	65				
	Finding specific information	40.985	65				
	Answering	141.167	65				
	Responding	470.258	65				
	Predicting	106.258	65				
	Expressing an opinion	201.167	65				
	Understanding	231.939	65				

In the VTS modality steps (i.e., guessing meaning, confirming and clarifying word meaning, imagining, describing, using prior knowledge, finding specific information, answering, responding, predicting, expressing an opinion, and understanding), there were statistically significant differences between the two groups, favoring the experimental group. The partial eta squared values were respectively.326, .391, .408, .226, .235, .151, .088, .278, .293; and.500. This indicates that, in terms of guessing meaning, confirming and clarifying word meaning, imagining, describing, using prior knowledge, finding specific information, answering questions, responding, predicting, expressing an opinion, and understanding, the instructional modality explained 32.6%, 39.1%, 40.8%, 22.6%, 23.5%, 15.1%, 8.8%, 27.8%, and 29.3%, respectively, of the variance.

The means of the VTS modality steps for the two groups were also retrieved, both adjusted and unadjusted. The two groups' averages, standard errors, and standard deviations for the VTS modality are shown in Table 7 both before and after the pre-test results were taken into account.

Table 7. Adjusted and Unadjusted Means of the VTS Modality Steps

Dependent Variable	Group	Unadjusted mean		Adjusted mean	
		Mean	SD	Mean	S. E
Predict	Control	3.0	1.6	3.0	.30
	Experimental	4.8	1.1	4.7	.30
Organize	Control	1.4	0.7	1.3	.14
	Experimental	1.5	0.6	1.6	.14
Search	Control	4.1	1.5	4.2	.22
	Experimental	5.0	0.4	4.9	.22
Summarize	Control	0.9	1.0	0.8	.21
	Experimental	1.3	0.9	1.3	.21
Evaluate	Control	1.4	1.5	1.3	.32
	Experimental	4.0	1.5	4.0	.32

Table 7 shows that there are differences between the two groups in the tenth VTS modality step still remaining after the differences in the pre-test scores are controlled. As such, the VTS modality enhanced students' performance in guessing meaning, confirming and clarifying word meaning, imagining, describing, using prior knowledge, finding specific information, answering questions, responding, predicting, expressing an opinion, and understanding.

Discussion

Reading comprehension is the capacity to comprehend a text clearly and to be able to summarize it. According to Reflianto et al. (2021) to read successfully, students must be able to draw conclusions from and comprehend the key concepts of the text. The student's reading objectives are to: a) identify the main idea, sentence, paragraph, or discourse; b) identify the key points; c) comprehend the flow and instructions; d) identify the organization of the reading materials; e) identify visual images and other reading-related images; f) come to a conclusion; g) predict meaning and conclusion; h) summarize the discourse read; i) recognize the difference between material that is factual

and opinion, and j) gather information from a variety of sources, such encyclopedias, atlases, maps, or digital annotation tools (Azmuddin et al., 2020).

Possible explanations for these results include the teacher's role, the use of images, students' engagement, motivation, higher-level thinking, structures, behavioral patterns, and enhanced retention. As a first point, the teacher in this case is a facilitator, and she is an experienced one at that since a seasoned educator would be better equipped to use this method in the classroom (Aslan & Turan, 2020). Experienced educators can manage class time effectively so that they can fully explain the method and direct student discussion.

Second, visuals not only aid in memory but also aid in comprehension (Hyerle, 2004). According to Wright (1990, p. 45), "images can play a crucial role in encouraging students, contextualizing the language they are using, providing them with a reference, and helping to regulate the task." Third, they must actively engage in the educational process. Students must work together to explore their environment, pose questions and wonders, conduct experiments, make predictions, test theories, come to conclusions, share their results, and, most importantly, act to improve the world. As a result, visual thinking practices in the classroom can support 21st-century learning (Gholam, 2018). Fourth, teachers discovered that each student is distinct and has different likes and dislikes. Burger and Winner (2000) concluded that when children are involved in the process of creating visual art, they are more motivated to read and write. Fifth, visual thinking practices are applied in the classroom as behavioral patterns, structures, and tools (Ritchhart et al., 2011). VTS routines are employed as tools to promote particular thinking processes, including creating connections, summarizing what is presented, developing explanations, assessing competing ideas and perspectives, capturing the essence and drawing conclusions, and reasoning with evidence (Ritchhart et al., 2011).

The results of this study are in agreement with those of other researchers who carried out quasi-experimental research to ascertain how VTS affects reading (see Ardihan, 2020; Aslan & Turan, 2020; Aulia, 2017; Damayanti et al., 2020; Echeverri Acosta & McNulty Ferri, 2010; Ghazanfari, 2009; Lhadon, 2019; Lutz, 1980; Musdizal, 2019; Rader, 2009; Zelvis, 2008). These studies' findings indicate that using VTS improves reading comprehension.

The primary design aspect of the graphic novel and illustrated book is the use of images, which are no longer secondary to the printed text but rather function as a system of meaning in and of themselves. Learning to read a novel now includes navigating and analyzing visual images, design elements, and graphic frameworks in addition to learning to decode and comprehend textual information (Serafini, 2012). Recent discoveries in physics and neuroscience help to explain how peripheral images interact repeatedly with higher brain areas that control symbolic representation. This recurrent process gives seeing with focused attention to things like color, line, depth, and form meaning and comprehension (Heath, 2000).

The 'visual brain' extends its operations to areas that link perception to meaning and understanding, which are closely tied to aesthetic sensibilities. Art is the depiction of constant, significant components of the outside world. The verbal elaboration and explanation of specifics, abstractions, and processes that result in the formation of theories based on propositional, procedural, and dispositional knowledge are made possible through collaborative work in the arts. The flurry of verbal, visual, and gestural interactions that emerge from interacting with various representational modalities encourages the development of the capacity to concentrate, plan, separate, and explain components, as well as integrate possibilities through potential futures (Heath, 2000).

In order to fully understand the complexity of these texts, students are encouraged to investigate non-linear patterns and pay attention to various visual representations, design elements, and structures (Serafini, 2005). In order to comprehend these complex texts, readers must develop into more introspective, engaged readers who use a variety of interpretive techniques. Hughes (2017) argues that it is crucial for kids to understand how to process words and visuals simultaneously while reading. Students who picture while reading not only have a richer reading experience but also have better long-term memory retention (Harvey & Goudvis, 2007). Additionally, Gear (2015) notes that readers create mental images when they fantasize. A reader's confidence level rises as a result of having a greater knowledge of the material and reading that is more engaging.

Combining strategies like anticipating, utilizing background information, and imagining is the most effective strategy to improve reading comprehension for children who are falling behind (Dahle, 2017). Visualizing will help readers imagine, create, ask questions, and develop (Mertz, 2015). The drawing technique's main focus is on illuminating a word's visual connotation or the text's overall context. Kica (2022) came to the conclusion that the reading comprehension of students in EFL classes is improved by the drawing activity strategy.

Altun (2015) claimed that a simple drawing can have a significant impact on students' ability to memorize language upon sight of the visualization of words, despite the fact that being an artist is not a requirement for a teacher. By asking students to comment on and debate the drawings, you open up a dialogue between them and encourage reciprocal discussion, which improves classroom collaboration overall. Thinking within the activity of groups of people working on a collection of problems over time makes it possible for conceptual comprehension, the development of skill in symbol manipulation, and involvement in inquiry practices like formulating hypotheses, using evidence, explaining, and arguing toward a point (Heath, 2000).

In both print-based and multimodal text reading, the reader's schema is vital. Any new content, whether it be written or visual, will elicit different reactions and interpretations, as well as different meanings, depending on how we read it. As we read text, look at photos, and browse electronic screens and hyperlinks, we engage in a cyclic, interactive process. We relate prior experiences to words, images, screens, and their content in order to create new meanings. These fresh interpretations and responses will be sparked by a fresh text. The reader's head is where these processes take place (Walsh, 2006). Whereas some researchers such as Croll (1983) and Salih (2019) find there is no effect of VTS on reading. This may be related to their sample, the way they have applied the strategy, and the conditions of their experiments. This opens the door for more research on the effect of VTS.

Conclusion

The value of VTS as an instructional strategy for reading skills is well acknowledged by scholars. This research also supports this result. This paper introduces a suggested instructional program for using VTS for reading sub-skills. The students who were instructed by VTS performed better in reading sub-skills. This result may be due to these reasons: the teacher's role, the use of images, students' engagement, motivation, thinking, structures, behavioral pattern, and increasing retention. VTS and reading sub-skills share the same sub-skills and strategies. Our students should encourage to have an active role in their reading. Reading is a cognitive and interactive process where the reader interacts with the text.

Recommendations

Based on the above result and consequence, some recommendations will be made to the students, English teachers, and other researchers. These recommendations are:

1-To the students: They need to read more text and if they have some difficulties they can sketch what they read. In other words, they can sketch what they imagine to make connections between ideas, activate schemata, understand the intended meaning, ask themself questions to comprehend the purpose of the author, predict and attempt to figure out the meaning of new terms and finally respond to the writer's questions. All the previous steps are part of VTS.

2- To the teachers: They need to use different strategies and integrate some with each other to suit the needs of their students and improve their students' reading sub-skills. The role of the teachers in implementing VTS is very crucial. If they don't create a safe environment and guide their students the VTS is will be ineffective.

3- To the other researchers: Because this strategy has different conflicted results more research is required. Longitudinal studies are suggested to test the effect of this strategy on reading sub-skills. More research can be done on other levels and other English skills.

Limitations

The results of this study cannot be applied to all levels and grade levels since they can only be applied to groups that are similar to the sample. Consequently, a random sample is useless. Furthermore, this study will last for 8 weeks in a public school; it is possible that the outcomes would vary if the study lasted longer. Giving VTS instruction is additional.

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Authors Contribution Statement

Al-Shdeifat: Conceptualization, design, analysis, writing. Al-Jamal: Editing/reviewing, supervision.

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Appendix

Lesson Plan (1)

Module two: The man who wears a kufiyah…. **Unit** Three: Traditional garments

Class: 9th Grade **Duration**: 45 minutes

Lesson 1 / **Week** one / **two Days**

Outcome:

At the end of the lesson, students are expected to: practice using visual thinking strategy

Steps	Procedure
Warm-up (45 minutes)	- T. defines the VTS using her words and explains it. - T. mentions the expected benefits of it. T. states the benefits of visual thinking as follows: • achieves students' comprehension; • helps in recalling information; • gives more enjoyable and engaging reading; • involves personal emotions and opinions; • creates a collaborative task. - T. models the strategy by showing the class the following picture through the 'data show'. 
Pre-reading stage:	- T. asks students: what is going on in the picture in this picture? - SS. answers. - T. guides the discussion by asking students what makes them say that. - Ss. give pieces of evidence from the picture. - T. asks students what they can infer from the picture. -Ss. guess.
While reading stage: (25 minutes)	-T. reads the first line and draws an image or points to the picture. "Hello! I'm Danielle Cluer. I live in England. I'm studying World Literature at my local university. I am currently working on a project about ancient literature. I am reading about the world's earliest pieces of literature in the library at the moment. I like to read about the oldest and most famous stories in the world. Some of them tell the story of kings and their adventures. These stories show the skills of the poets at that time and their influence on other poets from around the world." (For practicing from 7th grade). - Then Ss. read the following lines and draws their images on their paper or point to the picture. - T. inquires about her name while reading questions such as the first line. Where does Danielle live? What does she research? - Ss. answer the questions.
Post-reading stage:(20 minutes)	- T. asks students the following questions: What is the main idea of the text? Guess the meaning of the new words from the context Describe the girl in the picture. Do you like reading express your opinion why? Why not? - Ss. answer. - T. evaluates their reading skill using a reading rubric scale.

Lesson Plan (2)

Module two: The man who wears a kufiyah…. **Unit** Three: Traditional garments

Class: 9th Grade **Duration**: 45 minutes

Lesson 2&3 / **Week** two / **two Days**

Outcomes

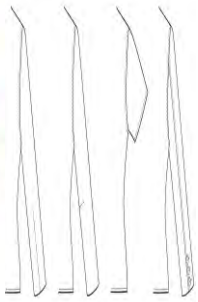
At the end of the lesson, students are expected to …

• demonstrate understanding of a reading text by matching information with pictures

• use context to guess the meaning of new words

• use dictionaries and glossaries to confirm and clarify word meaning

• interview peers about preferences for a questionnaire

Steps	Procedure
Warm-up (10 minutes)	- T. shows students the following pictures to teach them the new vocabulary items.  Custom  Tunic  Jumper  Headdress  Sleeves  Head band  Wrap  Robe  Garment  Silk  Kufiyyah - Ss. look at the pictures and name the clothing item s if they know what they are. If they don't T. instructs them to read their names from the cards.
Pre-reading stage: (35 minutes)	- T. asks students to look at this image.

- T. asks what is going on in the picture.
- Ss. answer.
- T. asks why you said that.
- Ss. gives evidence from the picture.
- T. asks Ss. what you can infer from this picture.
- T. asks students to predict what text they are going to read about.
- Ss. anticipate.

While reading stage:

(25 minutes)

- T. asks students to read the title to check their anticipation.
- Ss. read.
- T. asks students to look again at the pictures in their book.

- T. asks Ss. what is going on in the picture.
- Ss. answer.
- T. asks Ss. why did they say that?
- Ss. give evidence.
- T. asks Ss. what else they can infer.
- T. reads the first line and draws the possible mental image or she can use the picture in the book.
- Ss. read the following lines and draw their mental images with the aid of the pictures in their books.
- While reading, T. asks questions such as, "Who is the man wearing the tunic?" What is the name of the long-sleeved tunic? When did he put it on? Did he ever wear jeans before? Is this still done by Jordanians?
- Ss. answer.

Post-reading stage:

(20 minutes)

- T. asks students these questions:

What is the main idea of the text?

Guess the meaning of the new words from the context.

- T. assess their reading skills using the rubric scale.
- T. asks Ss. What do they think about traditional costumes are they important why? Why not?
- Ss. express their opinions.

Assessment

- T. assess their reading skills using the rubric scale p. 52.

Lesson (3)

Module two: The man who wears a kufiyah…. **Unit Three**: Traditional garments

Class: 9th Grade **Duration**: 45 minutes

Lesson 4&5 / **Week** three / **two Day**s

Outcome: At the end of the lesson, students are expected to use relative pronouns to describe people based on their photographs

Steps	Procedure
Warm-up (45minutes)	T. asks Ss. to look at this picture.  T. asks what is going on in the picture. - Ss. answer. - T. asks why you said that. - Ss. gives evidence from the picture. - T. asks Ss. what you can infer from this picture.
Pre-reading stage:(5 minutes)	- T. asks students to predict what text they are going to read about. - Ss. anticipate. - T. asks students to read the question and she explains the exercise.
While reading stage:(25 minutes)	- Ss. read the first sentence, sketch what they read if it is possible and circle the correct relative clause based on their mental imagery. - T. asks Ss. to read more, sketch, and circle the correct relative pronoun. - T. asks Ss. what is going on in their picture. - Ss. answer. - T. asks Ss. why they said that. -Ss. give evidence. -T. asks while reading questions such as: what is a charity shop? What do people who want to buy cheap clothes do? How do people who donate clothes feel? -Ss. answer.
Post-reading stage:(15minutes)	- T. asks students these questions: What is the main idea of the text? Guess the meaning of the new words from the context. - T. assess their reading skills using the rubric scale. - T. asks Ss. What do they think about charity shops are they important why? Why not? - Ss. express their opinions.

Appendix B

Reading sub-skills Pre/post Test

Ninth- grade

Student Name: day and date:

Time: 60 minutes (45 points)

Article A: Read the article about body language. Then answer the following questions:

SPEAK WITH YOUR BODY WELL

There's a difference between what we say and what people understand from the words we utter. When we speak, we also communicate and deliver messages with our faces, our hands, and even our whole bodies. We call this kind of communication, body language or non-verbal communication. Body language also includes hand gestures, facial expressions, and eye contact. Psychologists estimate that almost 80% of our daily communication with people is non-verbal. Our feelings, moods, and attitudes are expressed better with our body language than with the words we say. For instance, if you say something positive with a negative facial expression, people won't believe your words as much as they will believe your nonverbal facial expression. As a result, your words will not successfully deliver your message. So if you want to succeed in communicating your thoughts and feelings, you must learn to "speak" with your body well!

1 Guess the meanings of these words from the context then match the words from the article (1–5) with their meanings (a–e). (1 mark each)

1. utter a. oral
2. estimate b. entire
3. attitude c. guess
4. verbal d. say
5. whole e. approach

2- Imagine what happens if you say something negative while smiling (2 marks).

3- Describe how can we "speak "with our bodies (3 marks).

4 Give an example of a consequence word from your prior knowledge (1 mark).

5 Find out how much nonverbal communication we use (2 marks).

6 Answer the following question According to the writer: (2 marks each)

Why is body language more believable than our words?

7 Express your opinion. Do you agree with the writer's opinion about body language? Why / Why not? (3 marks each)

8 To check your understanding of this article, what is the meaning of the title of the article (Speak with your body well)? (2 marks)

a. Non-verbal communication is very important.

b. Your body can speak an international language.

c. You must use your body language to communicate better.

Article B: Read the article about money and happiness. Then answer the following questions.

MONEY CAN NOT BUY HAPPINESS

Happiness is a state of mind that we feel within ourselves. So an object should not identify that happiness. An object can make us happy for a moment but not for a lifetime. That's why I think that money cannot buy someone's happiness. When I was young, I used to think that money made everything possible and better. However one day my family lost their money and we could no longer do the things we desired to do. So we were obliged to start watching the way we spent our money. This particular experience taught me that I didn't need money to be happy. My happiness comes from my family and friends. It is a feeling that comes from within. Nowadays, a lot of people think that money is everything. They haven't figured out the truth yet. Some never will because they think that money is happiness, so they live all their lives miserable. Some other people find out the truth as I did and try to change things by giving away money to charities and people in need.

9 Guess the meanings of these new words from the context then match the words from the article (1–4) with their meanings (a–d). (1 mark each)

1. nowadays a. unhappy

2. figure out b. donation

3. charity c. in our time

4. miserable d. discover

10 Choose one of the following to describe the author's attitudes on financial matters: (a, b, or c). (2 marks)

a. You should not have money because it makes you unhappy.

b. Money is not everything.

c. Money can make you happy for a lifetime.

11 Imagine for a moment that you have a significant amount of wealth; what plans do you have for it? (2marks)

12 Consider the things that bring you joy and jot down an example of each. (1 mark)

13 In light of what you know, can a material possession bring you joy? Why / Why not? (1 mark)

14 Identify the main lesson the speaker learned from his / her experience. (1mark)

15 Respond to the writer's question about what people think about money nowadays. (2marks)

16 What do you predict some people, who know the truth about money, will do? (1 mark)

17 Comment on the relationship between money and happiness; do you agree with the writer's assessment? Why / Why not? (3 marks)

18 According to your explanation of this article, what other things can make you happy? (3marks)

19 What can you infer from this statement some who think that money is happiness, live all their lives miserable (2 marks). Students answer

20 Answer the following question according to the writer: why does he/ she think happiness comes from family and friends? (1 mark).